(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
2 June 2016 (02.06.2016)

WIPO | PCT

(10) International Publication Number
WO 2016/084985 A1

(51) International Patent Classification:
B60C 11/00 (2006.01)

(21) International Application Number:
PCT/JP2015/084085

(22) International Filing Date:
27 November 2015 (27.11.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PCT/JP2014/082344
28 November 2014 (28.11.2014) JP

(71) Applicants *(for all designated States except US)*: **COMPAGNIE GENERALE DES ETABLISSEMENTS MICHELIN** [FR/FR]; 12, cours Sablon, Clermont-Ferrand 63000 (FR). **MICHELIN RECHERCHE ET TECHNIQUE S.A.** [CH/CH]; Route Louis-braille 10, Granges-Paccot 1763 (CH).

(72) Inventor; and
(71) Applicant *(for US only)*: **NOMURA, Masayoshi** [JP/JP]; c/o NIHON MICHELIN TIRE CO., LTD., Shinjuku Park Tower 13F, 3-7-1, Nishi-shinjuku, Shinjuku-ku, Tokyo, 1631073 (JP).

(74) Agents: **NISHIJIMA, Takaki** et al.; Nakamura & Partners, Shin-Tokyo Bldg., 3-1, Marunouchi 3-chome, Chiyoda-ku, Tokyo, 1008355 (JP).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

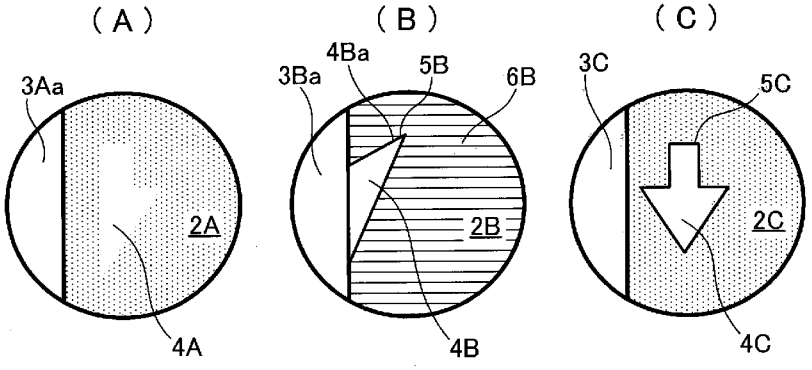
(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) Title: TIRE TREAD FOR IMPROVING EFFICIENCY IN MOUNTING OPERATION

FIG.3



(57) Abstract: Present invention provides a tread (1) for a tire having a contact face (2) intended to come into contact with ground, the contact face (2) being given surface treatment so as to have a treated surface for improving performance during break-in period and having at least one indication (4) indicating at least one of a intended rotational direction DR and a axial orientation DA, the tread being characterized in that the indication (4) is formed by being devoid of the surface treatment. According to the present invention tire mounding efficiency is enhanced while easy recognition of tire break-in completion is obtainable.

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DESCRIPTION

Title of Invention: TIRE TREAD FOR IMPROVING EFFICIENCY IN MOUNTING OPERATION

FIELD OF INVENTION

(0001) The present invention relates to a tread for tire and in particular to a tread having an indication for indicating a correct mounting direction of tire onto a rim, and to a tire having such tread.

BACKGROUND

(0002) It is known that some tires have an intended rotational direction and/or an intended inside-outside orientation. It is necessary for such tires to be mounted on the rim in a correct mounding direction in order to achieve desired performance.

(0003) However, it is sometimes not easy to recognize the correct mounding direction only from the appearance of the tread.

(0004) Therefore, tires having an indication (marking), such as letters "OUTSIDE", for indicating a correct mounting direction have been suggested. However, since such markings are provided on the outer surface of the sidewall, if the tires are horizontally piled up or stacked flat, it is difficult for operator to find the indication and to confirm the correct mounting direction.

(0005) On the other hand, EP0667251A1 discloses a pneumatic tire in which markings for indicating the intended rotational direction are applied to a bottom surface of a circumferential groove on a tread.

(0006) However, it is not easy to precisely place the markings on the predetermined position on the bottom surface of the circumferential groove, since the marking

is manufactured as a separate member from the tread. Thus, the manufacturing cost of such tire increases.

(0007) Further, some tires, especially winter tires, have treated surface on an outermost surface of the tread. The treated surface is provided in order to improve the performance of the tire during break-in period.

(0008) The treated surface is designed so as to be worn out when the break-in stage is completed. Therefore, it is important for the driver to recognize when the treated surface is worn-out. However, it is not easy to visually confirm whether the treated surface is worn out from the appearance.

(0009) It is an object of the present invention to provide a tread for a tire having an indication for correct tire mounting direction, which indication can be easily provided on the tread and can indicate the completion of the break-in period, and to provide a tire having such tread.

(0010) Definitions:

(0011) A "groove" is a space between two rubber faces/sidewalls which do not contact between themselves under usual rolling condition connected by another rubber face/bottom. A groove has a width and a depth.

(0012) An "incision" is a cut made on the contact face (tread surface) with a knife-like blade, and sometimes called as 'sipe'. The width (or thickness) of such incision on the contact face is relatively thin (that is to say less than 2.0 mm) compared to a groove. Two opposed rubber faces of such incision distant in a width (or thickness) direction may contact each other, at least partially and at least during passage of ground contact.

(0013) A "radial direction" is a direction perpendicular to an axis of rotation of a tire. This direction is the direction of the thickness of a tread.

(0014) A "transverse direction" or an "axial direction" or an "axial orientation DA" is a direction parallel to a rotational axis of a tire.

(0015) A "rotational direction" or a "rotational direction DR" is a direction tangent to any circle centered on an axis of rotation of a tire. This direction is perpendicular to both the radial direction and the transverse direction.

(0016) A "surface treatment" is a processing made on contact face subjected for improving tire's performance at new (initial) state, as for example forming a plurality of fine grooves (or fine ribs) on the contact face as expressed in document JPH07-186633A, or forming a micro roughness made onto a mold for manufacturing a tire via, for example machining, electrolytic corrosion processing, etching, shot blasting etc. and such roughness being transferred to the contact face of the tire as expressed in document JPH07-257111A. This surface treatment is usually made by molding a green (uncured) tire, but also applicable after vulcanization of such green tire via, for example hot stamping.

(0017) A "center region of the tread" is a central region when a tread is divided into three trisections in tire axial direction, that is to say a center region containing equatorial plane of the tread.

SUMMARY OF THE INVENTION

(0018) To meet this need, the invention provides a tread for a tire having a contact face intended to come into contact with ground, the contact face being provided with a surface treatment so as to have a treated surface for improving performance during break-in period and having at least one indication indicating at least one of a intended rotational direction DR and a axial orientation DA, the tread being characterized in that the indication is formed by being devoid of the surface treatment.

(0019) According to this arrangement, since the indication can be applied easily onto the tread for tire by making an area which is devoid of the treated surface on the contact face of the tire, manufacturing efficiency of the tire increases.

(0020) Further, completion of the tire break-in period can be easily recognized, as the indication disappear with the treated surface.

(0021) Preferably, the indication has a portion enable to encompass a circle with a diameter of at least 3mm.

(0022) According to this arrangement, it is easy to visibly confirm if the indication still remains.

(0023) Preferably, a total area of the indication on the tread with respect to the whole area of the contact face is at most equal to 5%.

(0024) According to this arrangement, it is possible to avoid impairing the performance of the tire due to shortage of the area of the treated surface. The area of the indication relative to whole area of the contact face is preferably at most equal to 3%, and more preferably in a range between 0.01% and 2%.

(0025) Preferably, the treated surface is formed by a plurality of fine grooves.

(0026) Preferably, the treated surface has a roughness (Ra) of between 0.005mm and 0.02mm.

(0027) Preferably, the indication is provided in an axially central region of the tread. According to this arrangement, better visibility of the indication can be contained, as the central region of the tread is the most noticeable region on the tread.

(0028) Preferably, at least a part of edge of the indication provided with a bordering.

(0029) According to this arrangement, the indication can be recognized. Such bordering can be made, for example by fine grooves, a protrusion, fine ribs, a plurality of strands (as expressed in document WO2007045425A1). The bordering can be in a form of one continuous line or combination of several lines, dashed line, dotted line, double line, or combination of these lines.

(0030) Preferably, the bordering is made by an incision. According to this arrangement, incision serves as supplemental water storage capacity improving tire performance in particular on ice.

(0031) Depth of this incision is preferably less than 50% of depth of the groove in order not to impair rigidity around the indication.

BRIEF DESCRIPTION OF THE DRAWINGS

(0032) Other characteristics and advantages of the invention arise from the description made hereafter in reference to the attached drawings which show, as nonrestrictive examples, of the embodiments of the object of the invention.

(0033) In these drawings:

(0034) FIG.1 is a schematic view of a tire having a tread according to first embodiment of the present invention;

(0035) FIG.2 is an enlarged view of a portion indicated as II in Fig.1;

(0036) FIG.3 shows variants of the identification shown in Fig.2;

(0037) FIG.4 is a schematic view of a tire having a tread according to a second embodiment of the present invention;

(0038) FIG.5 is a schematic view of a tread according to a third embodiment of the present invention;

DETAILED DESCRIPTION OF THE INVENTION

(0039) Preferred embodiment of the present invention will be described below with reference to the drawings.

(0040) A tire tread according to a first embodiment of the present invention will be described with reference to Figs 1 and 2. FIG.1 is a schematic view of a tire section of a tire tread 1 of dimension 205/55R16. Fig.2 shows a portion indicated as II in Fig.1. The tread 1 is provided with one circumferential groove 3a and a plurality of axial grooves 3b. The circumferential groove 3a extends in a circumferential direction along a tire rotational direction DR in an axially central region. The axial grooves 3b extend generally in a tire axial orientation DA. Note that the internal construction of this tire other than the tread is the same structure as conventional pneumatic radial tire, thus description of the internal construction will be omitted.

(0041) The tread 1 has a contact face 2 intended to come into contact with the ground during rolling. The contact face 2 includes a treated surface formed by a plurality of fine grooves 6 extending in an axial direction. The sizes of the fine groove 6 are for example 0.005-1.5mm in depth (the radial direction), 0.01-1.0mm in thickness and 0.1-2.0mm in pitch (distance between two adjacent fine grooves).

(0042) As shown in Fig.1, a plurality of indications 4 is formed on the contact face 2. In this embodiment, the indications 4 have an arrow-like shape which directs the intended rotational direction DR of the tire.

(0043) The indications 4 are positioned both sides of the circumferential groove 3a in staggered manner.

(0044) Each indications 4 has a size which contains a portion enable to encompass a circle 4a with a diameter of at least 3mm.

(0045) The indications 4 are formed by being devoid of the fine grooves 6. That is, the surface of the indications 4 does not include fine grooves and is substantially flat or even. Thus, the surface of the indications 4 is different in reflection from the treated surface made of the fine grooves 6.

(0046) For example, the indication 4 is formed by a substantially even surface so as to correspond to the indication provided on an inner surface of a mold used for molding the tire.

(0047) The indication 4 is provided in a center region of the tread 1 alternately across the groove 3 extending in the rotational direction DR by changing its shape symmetrically with respect to the groove 3 extending in the rotational direction DR. All the indications 4 on the contact face 2 are indicating the same tire rotational direction DR.

(0048) A total area of the indications 4 relative to the whole area of the contact face is at most equal to 5%, preferably at most equal to 3% and more preferably in a range between 0.01% and 2%.

(0049) In the present embodiment, on the sidewall 7, another indication 8 indicating the intended rotational direction of the tire is provided. Another indication 8 includes an arrow-like marking and letters of "ROTATION".

(0050) In this embodiment, since the indication 4 is different in reflection from the treated surface made of fine grooves 6, easy recognition of a correct mounting direction can be obtained, thus mounting operation efficiency is enhanced.

(0051) Since the indication 4 has a portion enable to encompass a circle with a diameter of at least 3mm, visibility of the indication 4 can be improved.

(0052) Since the indication 4 is positioned in the center region of the tread 1, the operator can easily find the indications 4, resulting that mounting operation will be improved.

(0053) Since the total area of the indication 4 relative to that of the contact face 2 is at most equal to 5%, preferably less than or equal to 3%, more preferably within the range between 2% and 0.01%, the effect derived from fine grooves 6 can be maintained.

(0054) Since the indication 4 disappears with the fine grooves 6, completion of the tire break-in period can be easily recognized.

(0055) The form and orientation of the fine grooves 6 is not limited to straight line extending in the tire axial direction. The fine grooves can extend in the tire rotational direction or a direction oblique to the tire rotational direction in wavy, zig-zag and/or an arc manner. Combination of several types of the fine grooves can also be applicable.

(0056) The indication 4 is formed by a substantially even surface corresponding to the indication 4 provided on an inner surface of a mold used for molding the tire. Thus, efficiency for manufacturing such tire is enhanced and the manufacturing cost is reduced.

(0057) A variation of the first embodiment of the present invention will be described referring to Fig.3. Fig.3 shows variants 4A-4C of the indication 4 shown in Fig.2.

(0058) As shown in Fig.3(A), an indication 4A is formed on the contact face 2A of the tread adjacent to a circumferential groove 3Aa. The contact face 2A is a treated surface having roughness (Ra) of between 0.005mm and 0.02mm. The

roughness (Ra) can be obtained, for example, by manufacturing the tire by a mold on which inner surface treatment such as sandblasting had been given.

(0059) The roughness (Ra) of the surface of the indication 4A is between 0.002mm and 0.003mm, which identical to that on a normal tire tread without surface treatment.

(0060) As shown in Fig.3(B), an indication 4B formed on a contact face 2B with fine grooves 6B has a triangle shape open to a circumferential groove 3Ba. The indication 4B has a bordering 5B therearound. A tip end of the triangle shape is directed substantially to the intended rotational direction of the present tire. By combining the triangular shaped indication 4B with the circumferential groove 3Ba, the indication 4B can indicate one direction similar to an arrow.

(0061) As shown in Fig.3(C), an indication 4C with a bordering 5C has a double sided allow shape. The indication 4C is formed on a contact face 2C with the roughness (Ra). However, any other shape indicating an orientation can be used for an indication in the present invention.

(0062) The bordering 5C provides better visibility of the indication by emphasizing contours of the indication so as to improve the efficiency in mounting operation.

(0063) The bordering 5B and 5C in Fig.3(B) and 3(C) is formed by one fine groove. The bordering may also be made, for example by fine ribs, a protrusion, a plurality of strands as expressed in document WO2007045425A1. The bordering can be formed so as to be seen as one continuous incision line or combination of several lines, dashed line, dotted line, double line or combination of these lines.

(0064) Alternatively, the indications 4, 4A, 4B, 4C can be provided after curing a tire having the plurality of fine grooves 6 onto the tread 1 or roughness, for example by a hot stamping.

(0065) A tire tread according to a second embodiment of the present invention will be described referring to Fig.4. Fig.4 is a schematic view of a tire having a tire tread 21 according to the second embodiment of the present invention. The tread 21 has two circumferential grooves 23a, 23b extending in the tire rotational direction DR.

(0066) A contact face 22 of the tread 21 has roughness (Ra) of between 0.005mm and 0.02mm as a treated surface. The roughness (Ra) is measured according to standard ISO 4287:1997 and JIS B 0601.

(0067) This tread 21 has a specified (intended) inside-outside orientation in the tire axial orientation DA. On one sidewall 27 which should be placed on axially outside of a vehicle when the tire is mounted to the vehicle, letters "OUTSIDE" 28 are placed in order to indicate intended mounting orientation of the tire in the axial direction.

(0068) A plurality of indications 24a, 24b is formed on the contact face 22. The indications 24a, 24b are formed by being devoid of the treated surface (roughness). In the second embodiment, indications have different shape, that is triangle shape 24a and an arrow-like shape 24b. Both of them are directing to the tire outside orientation along the tire axial orientation DA.

(0069) The indications 24a, 24b are positioned adjacent to the circumferential groove 23a on the outer side thereof. The indications 24a, 24b have different shapes from each other and are alternately placed along the tire rotational direction DR.

(0070) A total area of the indications 24a, 24b relative to the whole area of the contact face, is at most equal to 5%, preferably at most equal to 3% and more preferably in a range between 2% and 0.01%.

(0071) Each indications 24a, 24b has a size which contains a portion enable to encompass a circle 24c with a diameter of at least 3mm. Each of the indication 24a, 24b has a bordering 25 made by an incision.

(0072) According to this embodiment, in addition to the advantages described above, the bordering 25 made by an incision can act as supplemental water storage to further improve tire performance in particular on ice.

(0073) By modifying a depth of the incision, the indications 24a, 24b can provide other information, for example timing for tire rotation. Depth of the incision is preferably less than 50% of a depth of the groove 23a for not impairing a rigidity around the indication 24a, 24b.

(0074) A tire tread according to a third embodiment of the present invention will be described referring to Fig.5.

(0075) A plural pairs of indications 34a, 34b shown in Fig.5 (A) is provided on a contact face 32 (only one pair is shown in Fig.5 (A)). The indications 34a, 34 are formed by being devoid of the roughness (Ra).

(0076) One indication 34a in Fig.5(A) has an arrow-like shape with single-sided arrow head provided without bordering and indicates the tire axial orientation DA. Another indication 34b has an arrow-like shape with a double-sided arrow head including the bordering 35 of a continuous line and indicates the tire rotational direction DR.

(0077) A plural pairs of indications 44a, 44b shown in Fig.5 (B) is provided on a contact face 42 (only one pair is shown in Fig.5 (B)). The indications 44a, 44b are formed by being devoid of the fine grooves 46 on a contact face 42.

(0078) One indication 44a indicates the tire axial orientation DA (left-right direction on Fig.5) and the another indication 44b indicates the tire rotational direction DR (up-down direction on Fig.5).

(0079) The pair of the indications 44a, 44b in Fig.5(B) has an arrow-like shape with single-sided arrow head provided with bordering 45 shown by dotted lines.

(0080) In this embodiment, the indication 44a, 44b can be applied also to a tread for a tire having both intended rotation direction and intended inside-outside orientation, providing increased mounting operation efficiency as described above.

(0081) Although two different arrows are used for indicating rotational and axial directions in the embodiment shown in Fig.5(A), the same arrows can be used for indicating rotational and axial directions as shown in Fig.5(B). Further, the pair can be a combination of an indication with bordering and an indication without bordering.

(0082) The molding element of the present invention can be used not only for molding a pneumatic tire but also for molding a tread portion of non-pneumatic tire such as a solid tire or a tire with flexible spokes (such as a non-pneumatic tire known under the trade name "TWEEL" (registered trade mark)).

(0083) The invention is not limited to the embodiment described above. Various modifications can be made within the scope of the claimed invention.

CLAIMS

1. A tread (1) for a tire having a contact face (2) intended to come into contact with ground, the contact face (2) being provided with a surface treatment so as to have a treated surface for improving performance during break-in period and having at least one indication (4) indicating at least one of a intended rotational direction DR and a axial orientation DA, the tread being **characterized in that** the indication (4) is formed by being devoid of the surface treatment.

2. The tread (1) according to claim 1, **wherein** the indication (4) has a portion enable to encompass a circle with a diameter of at least 3mm.

3. The tread (1) according to claim 1 or claim 2, **wherein** a total area of the indication (4) on the tread (1) with respect to the whole area of the contact face (2) is at most equal to 5%.

4. The tread (1) according to any one of the claims 1 to 3, **wherein** the treated surface is formed by a plurality of fine grooves (6).

5. The tread (1) according to any one of the claims 1 to 3, **wherein** the treated surface has a roughness (Ra) of between 0.005mm and 0.02mm.

6. The tread (1) according to any one of the claims 1 to 5, **wherein** the indication (4) is provided in an axially central region of the tread.

7. The tread (1) according to any one of the claims 1 to 6, **wherein** at least a part of edge of the indication (4) provided with a bordering (5).

8. The tread (1) according to claim 7, **wherein** the bordering (5) is made by an incision.

9. A tire having the tread according to any one of the claims 1 to 8.

FIG.1

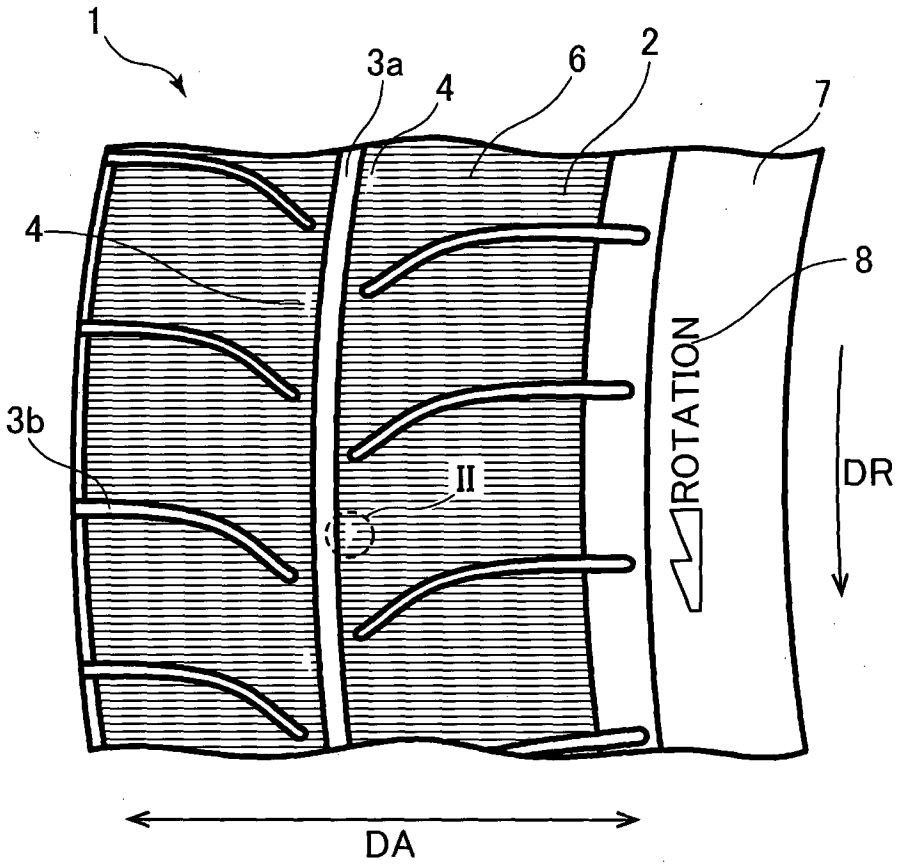


FIG.2

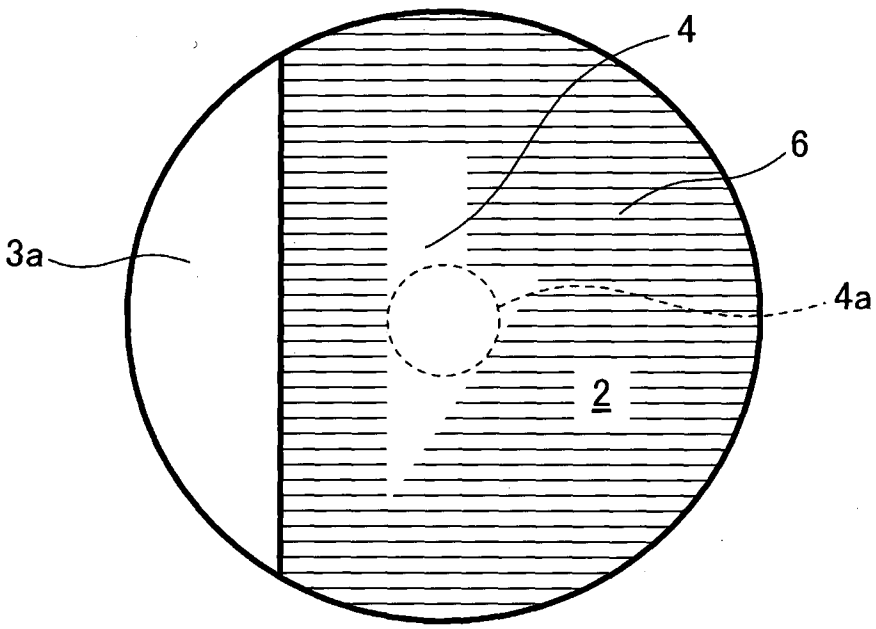


FIG.3

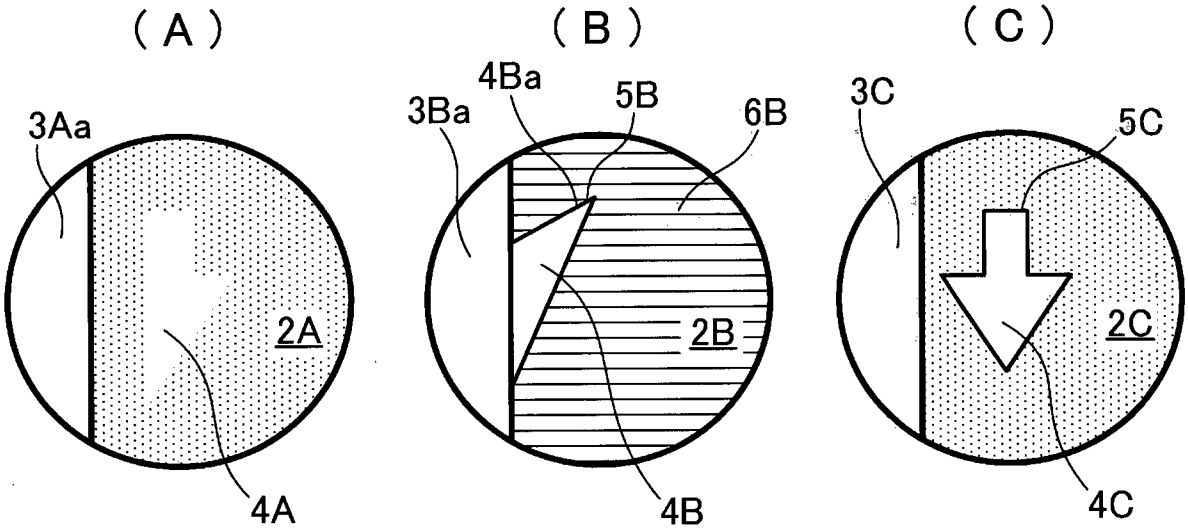

(A)
(B)
(C)
3Aa
2A
4A
4Ba
3Ba
5B
6B
2B
4B
3C
5C
2C
4C

FIG.4

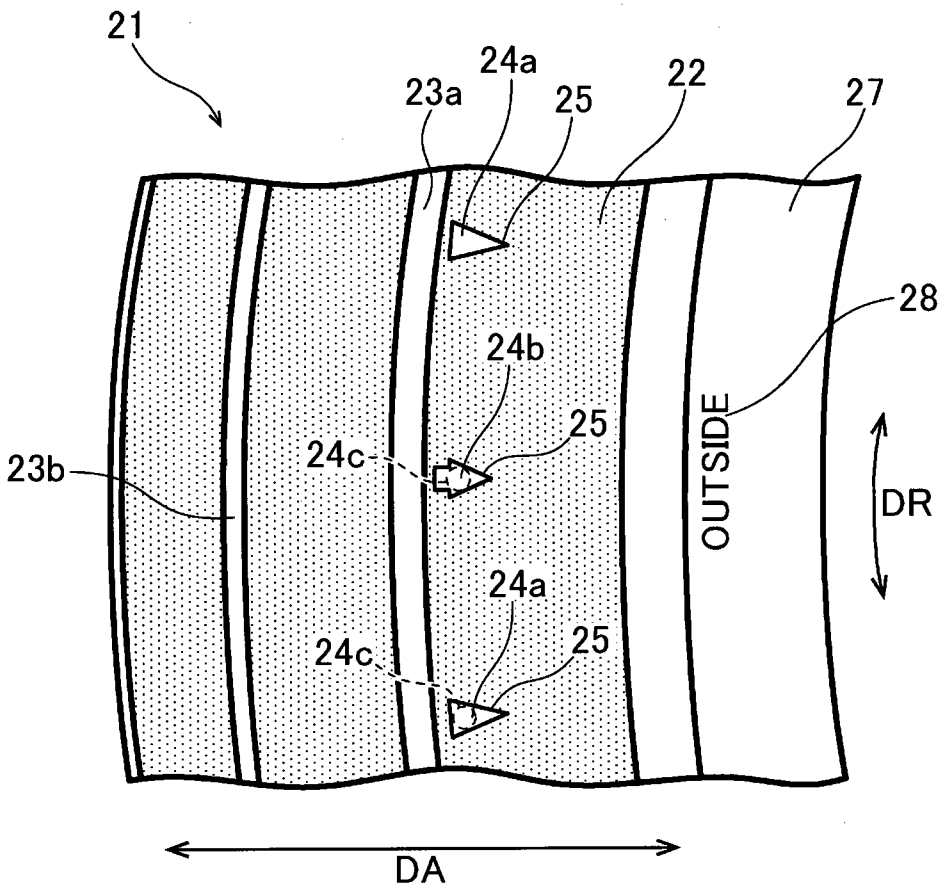
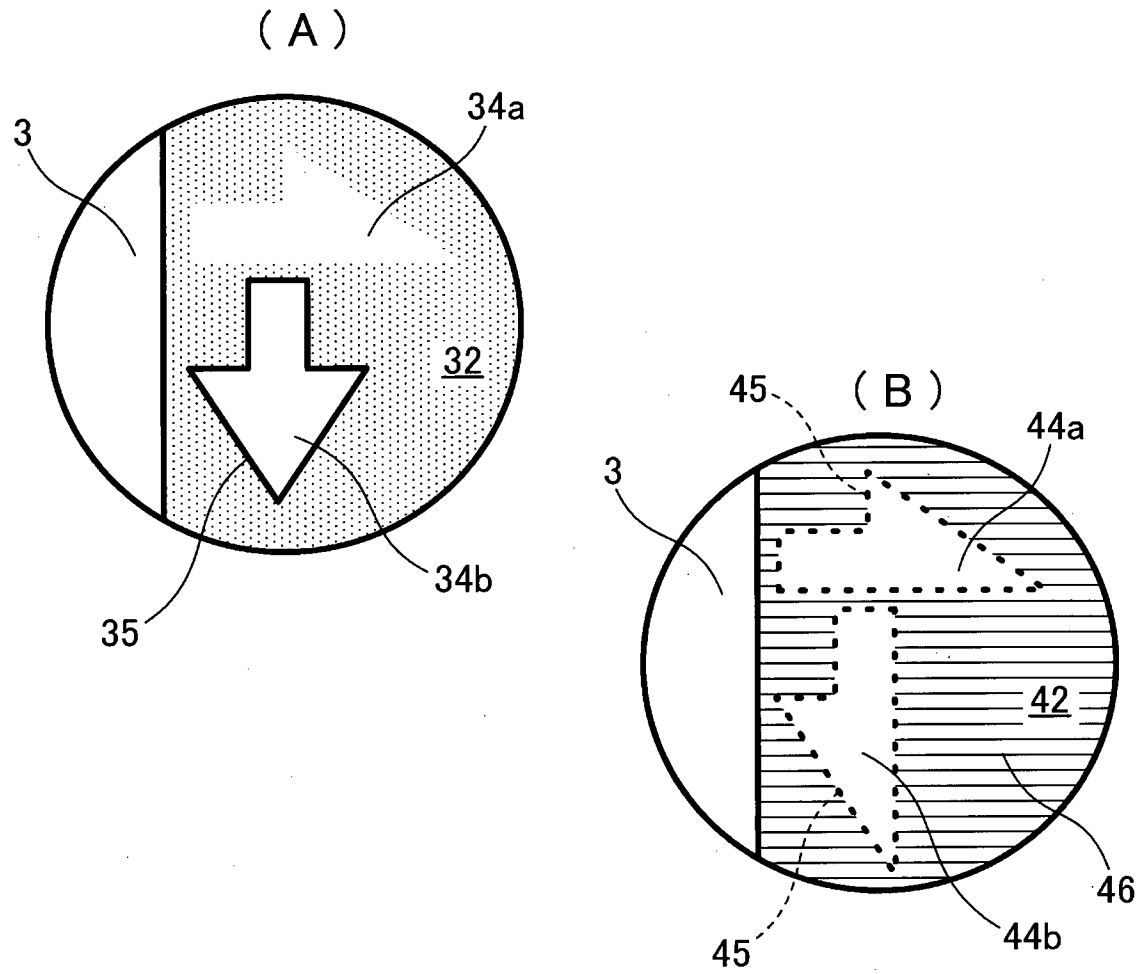

21
24a
23a
25
22
27
28
24b
25
24c
23b
OUTSIDE
DR
24a
24c
25
DA

FIG.5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/084085

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. B60C11/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. B60C11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2016
Registered utility model specifications of Japan 1996-2016
Published registered utility model applications of Japan 1994-2016

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2013/0118660 A1 (GAY, Didier) 2013.5.16, paragraphs [0001]-[0038], figures 1-2 & WO 2011/151311 A1 & JP 2013-527064 A & FR 2960473 A1 & CN 102917890 A	1-9
Y	Microfilm of the specification and drawings annexed to the written application of Japanese Utility Model Application No.60093/1989(Laid-open No.149302/1990) (SUMITOMO RUBBER INDUSTRIES, LTD.) 1990.12.19, page 4, lines 10-13, page 6, lines 1-7, figure 1 (Family: none)	1-9

☑ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18.02.2016	01.03.2016

Name and mailing address of the ISA/JP	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/084085

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2011/0083777 A1 (SOCIETE TECHNOLOGIE MICHELIN) 2011.04.14, paragraph [0022] & JP 2011-515266 A & WO 2009/115606 A1 & FR 2928866 A1 & CN 101977783 A	1-9
Y	JP 11-208217 A (THE OHTSU TIRE & RUBBER CO., LTD.) 1999.08.03, paragraph [0019], figure 2 (Family: none)	1-9
Y	JP 2014-172484 A (THE YOKOHAMA RUBBER CO., LTD.) 2014.09.22, paragraph [0022] (Family: none)	1-9
Y	US 2010/0000649 A1 (BRIDGESTONE CORPORATION) 2010.01.07, paragraph [0004] & JP 2008-137541 A & WO 2008/068969 A1 & EP 2090444 A1 & KR 10-2009-0088934 A & CN 101583502 A	1-9
Y	JP 2000-255224 A (SUMITOMO RUBBER INDUSTRIES, LTD.) 2000.09.19, paragraphs [0007] and [0020] (Family: none)	1-9
Y	JP 2007-290442 A (BRIDGESTONE CORPORATION) 2007.11.08, claims 1-2 (Family: none)	1-9
Y	CD-ROM of the specification and drawings annexed to the written application of Japanese Utility Model Application No.43191/1992(Laid-open No.93909/1993) (SUMITOMO RUBBER INDUSTRIES, LTD.) 1993.12.21, figure 6 (Family: none)	6-9
Y	JP 63-106108 A (BRIDGESTONE CORPORATION) 1988.05.11, page 1, lower right column, lines 9 to 11 (Family: none)	7-9